

## Social and Clinical Correlates of Postpartum Sterilization in the United States, 1972 and 1980

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### Synopsis .....

*This analysis is based on the 1972 and 1980 National Natality Surveys, conducted by the National Center for Health Statistics. About 10.6 percent (381,000) of women in the United States who delivered live infants in 1980 were sterilized postpartum. About 93 percent of*

*these postpartum sterilizations were tubal operations; only 1.4 percent were hysterectomies. Because the literature on the health correlates of sterilization is sparse, this analysis was exploratory.*

*In both 1972 and 1980, married mothers were more likely to be sterilized postpartum if they had previous fetal losses, underlying medical conditions, complications of pregnancy, or a cesarean delivery. Inspection of more detailed tabulations reveals that repeat cesarean delivery, multiparity, diabetes and at the higher birth orders, excess weight gain, and toxemia preeclampsia were associated with postpartum sterilization. An apparent association with varicosity may be due to misreporting. The degree to which each of these associations is causal or spurious awaits further research, but preliminary analysis suggests that some maternal health factors may influence some sterilization decisions. Beyond these specific maternal health conditions and complications, the evidence for a connection between poor maternal health and sterilization is equivocal.*

**S**TERILIZATION IS THE MOST COMMON intraabdominal surgical procedure performed in the United States on women of reproductive age (1). In the past, it was considered major and hazardous surgery and was done only for serious health reasons (2a). In this era of "safe" childbearing, do obstetricians and their patients with adverse health conditions discuss the risks of future pregnancies, decide that future pregnancies do not justify the increased risk, and choose to be sterilized (3)? Our exploratory analysis suggests that at least multiparity, cesarean delivery, and diabetes remain as significant correlates of postpartum sterilization; evidence that other conditions are associated with sterilization is equivocal. Questions of causality await further analysis.

The number of tubal sterilizations in U.S. non-Federal short-stay hospitals more than tripled in the 1970s, increasing from 201,000 in 1970 to 653,000 in 1978, according to reports from the Hospital Discharge Survey (4). In 1970, 29 percent of these operations were interval sterilizations (not associated with a delivery or other pregnancy outcome), compared with 53 percent of these operations in 1978. Laparoscopic techniques are often cited as the main reason for the growth in the number of interval sterilizations (4). The number of postpartum tubal sterilizations also increased, more than doubling between 1970 and 1980; the number rose from about 143,000 in 1970 to about 308,000 in 1978 (1).

Reports on sterilization in the medical literature tend to focus on operative techniques and failure rates (5,6). The obstetrical literature tends to emphasize that (a) except in instances when anesthesia is given for some other reason, such as for cesarean or vaginal delivery, tubal sterilization subjects the patient to all the risks of major surgery (7a,8a); (b) the operation is easier just after delivery, because the uterus is enlarged and the fallopian tubes are near the abdominal wall, up out of the pelvis (7a,9a,10); (c) the operation usually does not prolong the hospital stay after delivery (9); and (d) postpartum operations are less expensive than interval female sterilizations (2b).

An extensive search of the literature on postpartum and tubal sterilization revealed that information on the health indications for sterilization is sparse. Placek's brief reports from the 1972 National Natality Survey (NNS) (3) and the Hospital Discharge Survey (11) are the only direct precedents of this report. In textbooks and journals in the obstetrics and gynecology field, the health indications for sterilization are mentioned only in passing; they include recurrent toxemia, heart and lung disease, multiparity, diabetes mellitus, sickle cell anemia, and repeat cesarean sections (7b,8b,9b, and 12).

Placek's earlier reports (3,11) indicated that maternal health factors were associated with postpartum sterilization, but cesarean delivery was the only specific condi-

tion that was analyzed in detail. Various maternal health complications are more common in cesarean delivery (13-15), and cesarean delivery is more likely to be followed by sterilization than vaginal delivery (3,11). We therefore begin our analysis by comparing data from the 1980 National Natality Survey with data from Placek's analysis of the 1972 NNS (3) and will then explore some related aspects of postpartum sterilization.

### Sources of Data on Sterilization

The data in this paper on live births are based on results of the 1972 and 1980 National Natality Survey (NNS); the data on stillbirths are from the 1980 National Fetal Mortality Survey (NFMS). Mailed questionnaires were sent to the mother, hospital, physician, and other medical sources of care. Information about the mother's health, type of delivery, and postpartum sterilization are derived from the hospital questionnaire, which was filled out by a physician, nurse, or medical records technician, using the hospital delivery record. The design, methods, and scope of these surveys are described briefly in the introductory article to this section (pages 111-116).

When we refer to the sterilization data from the NNS and NFMS, we are referring to postpartum sterilization, "postpartum" meaning that the operation was performed at the time of delivery or before the mother left the hospital. Data on interval sterilizations are not available from the NNS.

Data on both postpartum and interval sterilizations are collected in two other surveys conducted by the National Center for Health Statistics. In the Hospital Discharge Survey, information is collected on the sterilizations done in non-Federal short-stay hospitals (1,11). Information on the characteristics of the patients, however, is limited, and sterilizations done in outpatient clinics are not included. The National Survey of Family Growth includes data collected from patients rather than from hospitals about operations on both sexes, regardless of when or where they were performed (16,17). However, detailed data are lacking on complications of pregnancy and labor and on underlying medical conditions.

### Results

**Comparisons of 1972 and 1980.** Table 1 and the chart show the percentages of U.S. married mothers who were sterilized postpartum in 1972 and 1980 according to selected maternal health characteristics and birth order. The comparison is restricted to married mothers because unmarried mothers were not included in the 1972 NNS. Overall, 7.8 percent of the married mothers delivering in 1972 were sterilized postpartum; this proportion increased to 11.3 percent in 1980. The percentage of

married mothers sterilized rose sharply in both years as the birth order of the child increased; the percentage ranged from 2 to 18 in 1972 and from 1 to 27 in 1980. If a mother had previous fetal losses, underlying medical conditions, complications of pregnancy, or a cesarean section delivery, she was more likely to be sterilized

Table 1. Percentages of U.S. married mothers sterilized following in-hospital delivery of a live infant in 1980 and in 1972, by maternal characteristics and live birth order

Year and maternal characteristics	All orders	1st order	2d order	3d or higher order
<b>1980</b>				
Total women	11.3	1.0	11.8	26.9
Previous fetal losses:				
0	10.2	.8	11.6	27.0
1	16.4	1.6	12.5	27.0
2 or more	19.9	19.0	15.6	25.7
Underlying medical conditions:				
0	10.6	.8	11.3	26.3
1 or more	14.7	11.9	14.1	28.7
Complications of pregnancy:				
0	10.7	.8	11.2	25.3
1 or more	12.9	11.4	13.8	31.1
Complications of labor:				
0	11.8	.9	11.7	25.3
1 or more	10.2	11.0	12.3	32.2
Type of delivery:				
Spontaneous	9.9	1.7	8.3	22.4
Forceps	8.0	1.3	13.2	28.8
Cesarean section	20.2	12.3	25.5	46.5
Other	10.2	12.3	19.2	27.1
<b>1972</b>				
Total women	7.8	1.9	5.3	17.6
Previous fetal losses:				
0	7.0	1.8	5.0	16.7
1	12.1	2.5	7.2	19.8
2 or more	15.3	2.6	7.7	22.3
Underlying medical conditions:				
0	7.0	1.7	4.9	16.1
1 or more	12.6	2.6	8.5	24.6
Complications of pregnancy:				
0	7.3	1.5	5.0	16.5
1 or more	10.5	3.5	7.2	23.2
Complications of labor:				
0	7.5	1.7	4.6	17.0
1 or more	9.0	2.3	8.4	20.0
Type of delivery:				
Spontaneous	7.6	1.6	4.1	14.7
Forceps	4.9	1.1	4.5	15.2
Cesarean section	25.3	7.9	22.0	57.2
Other	6.5	1.0	12.0	15.3

<sup>1</sup> Figure does not meet standards of reliability or precision; that is, the relative standard error is 25 percent or more.

*'The percentage of married mothers sterilized rose sharply in both years as the birth order of the child increased; the percentage ranged from 2 to 18 in 1972 and from 1 to 27 in 1980. If a mother had previous fetal losses, underlying medical conditions, complications of pregnancy, or a cesarean section delivery, she was more likely to be sterilized postpartum.'*

postpartum. The differences based on maternal health indicators held (with only one exception) within birth-order categories in both 1972 and 1980, although some were not statistically significant. In this and subsequent tables, figures are shown separately for first and second birth orders. Although this separation results in an increase in the number of cells marked unreliable, it allows important differences related to birth order to be shown.

Between 1972 and 1980, the proportion of mothers sterilized increased both among those with and those without maternal health complications. In contrast, the proportion sterilized after cesarean section delivery decreased from 25 to 20 percent between 1972 and 1980.

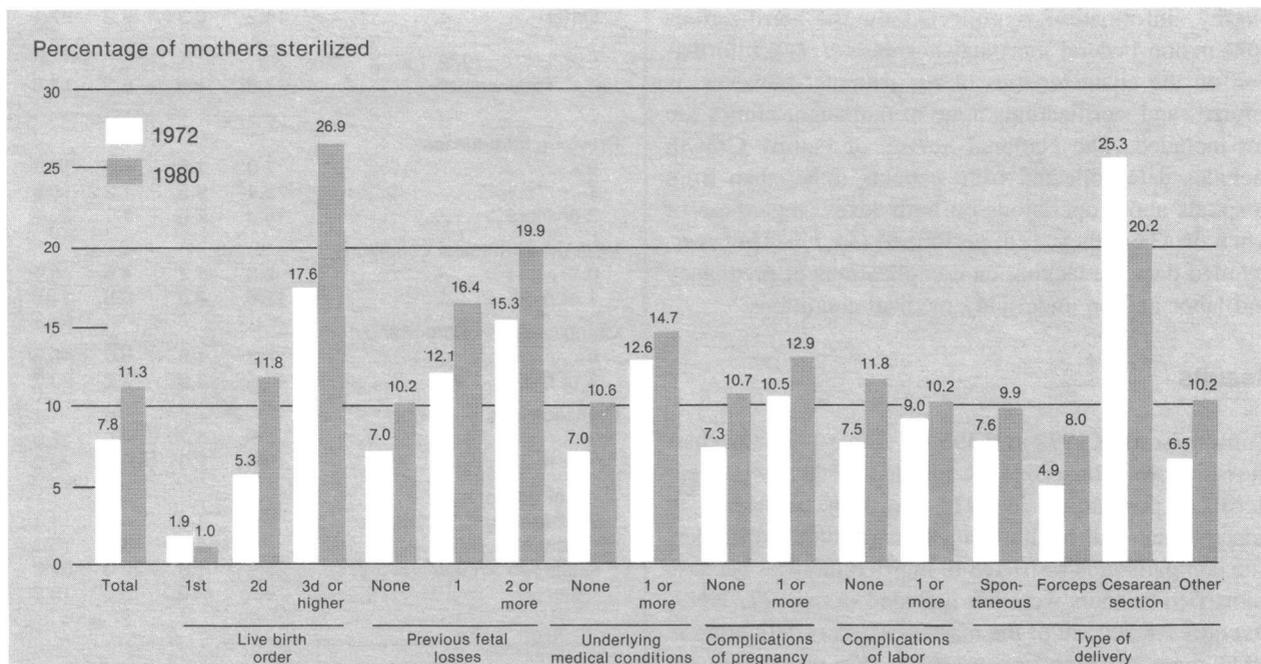
During the same period, however, the proportion of births to married mothers involving cesarean section increased from 7 to 17 percent (18).

But these results raise more questions than they answer. As noted, some maternal conditions or complications may be indications for sterilization—for example, severe cardiovascular disease, sickle cell disease, repeat cesarean section, obesity, hypertension, and diabetes—because future pregnancies may pose a high risk for women with such conditions. On the other hand, other conditions—such as severe obesity, cardiorespiratory disease, or massive adhesions from previous abdominal surgery—may be contraindications for sterilization because the operation itself would be hazardous (2b). At least two questions, therefore, need to be answered:

1. Are these complications common enough to be substantial contributing factors in the rising number of sterilizations in the United States?
2. Are some of the frequently occurring conditions and complications more closely associated with postpartum sterilization than others?

First of all, we need to know how common these complications and conditions are. The NNS hospital questionnaire asked: "Which of the following medical conditions existed during this pregnancy?" Similar questions were asked about complications of pregnancy and

Percentage of U.S. married mothers sterilized following in-hospital delivery of a live infant in 1972 and in 1980, by maternal characteristics



SOURCE: National Center for Health Statistics: Final data from the 1972 National Natality Survey and data from the 1980 National Natality Survey.

complications of labor. Each question was followed by a checklist with instructions to "check all that apply." The data in table 2 show that about 20 percent of the women delivering live infants in 1980 had one or more underlying medical conditions during pregnancy, the most common ones being obesity, anemia, Rh incompatibility, varicosity, and diabetes. Of the women delivering their first or second live-born child, 18.2 percent had one or more of these conditions, compared with 24.6 percent of those who delivered a live-born child of the third or higher birth order (table not shown).

Table 2 shows that 29 percent of the women who delivered a live-born infant in 1980 had one or more complications of pregnancy. About 5 percent had urinary infections. Anemia, obesity, excess weight gain, hypertension, and toxemia preeclampsia each affected about 3 percent. About 29 percent had one or more complications of labor, the most common being premature rupture of membranes, prolonged labor, inadequate pelvis, and toxemia preeclampsia.

As to whether some conditions are more frequently associated with sterilization than others, table 3 shows the sterilization rates for the more frequently specified underlying medical conditions, complications of pregnancy, and complications of labor, according to live birth order. Overall, 0.9 percent of the women delivering their first live-born child in 1980 were sterilized, compared with 11.6 percent of those delivering their second live-born, and 26.5 percent of those delivering a child of third or higher live birth order.

Among mothers with no underlying medical conditions, 9.9 percent were sterilized postpartum, compared with 13.5 percent among those with one or more underlying conditions. Among mothers with varicosity or diabetes, however, about 22 percent were sterilized postpartum, or more than double the percentage of mothers without underlying medical conditions. Among mothers with varicosity and diabetes, the percentages sterilized were especially high among those who had delivered three or more live-born infants; 39 percent of such mothers with diabetes and 33 percent of such mothers with varicosity were sterilized postpartum.

The association of sterilization with complications of pregnancy and of labor was more striking for women who had delivered live-borns of a third or higher birth order. Among mothers who had had three or more live births, 45 percent of those with excess weight gain and 45 percent of those with toxemia preeclampsia were sterilized, compared with only 25 percent of the mothers who had had three or more live births but had no complications of pregnancy. Of the mothers delivering a live-born infant of a third or higher birth order, 26 percent of those with no complications of labor were sterilized, compared with 41 percent of those with tox-

Table 2. Percentages of U.S. mothers who delivered live-born and stillborn infants in hospital in 1980, with selected complications and conditions

Complications and conditions	Live-born infants (N=3,581,000 women)	Stillborn infants (N=18,939 women)
<b>Underlying medical conditions:</b>		
0 .....	80.2	71.2
1 or more .....	19.8	28.8
<b>Selected conditions:</b>		
Varicosity .....	1.5	.7
Obesity .....	4.0	6.9
Anemia .....	2.6	2.8
Rh incompatibility .....	2.1	2.4
Diabetes .....	1.1	4.2
<b>Complications of pregnancy:</b>		
0 .....	70.8	52.6
1 or more .....	29.2	47.4
<b>Selected complications:</b>		
Urinary infection .....	4.8	4.9
Anemia .....	3.2	3.3
Obesity .....	2.7	5.9
Excess weight gain .....	3.0	3.3
Hypertension .....	3.2	7.6
Toxemia preeclampsia ...	3.0	5.3
<b>Complications of labor:</b>		
0 .....	70.9	42.0
1 or more .....	29.1	58.0
<b>Selected complications:</b>		
Inadequate pelvis .....	3.0	.9
Multiple birth .....	1.7	6.0
Premature rupture of membranes .....	5.3	5.1
Unusual bleeding or hemorrhage .....	1.1	5.4
Prolonged labor .....	3.7	2.0
Abruptio placentae .....	.7	11.8
Abnormal position of cord .....	2.2	8.5
Hypertension .....	1.8	4.6
Toxemia preeclampsia ...	2.5	4.6

emia preeclampsia and 34 percent of those with prolonged labor.

Table 4 shows the percentage of married mothers with specified underlying medical conditions who were sterilized in 1972 and 1980. The figures should be interpreted with caution because the number of sample cases is often small. However, the percentage sterilized among mothers with diabetes appears to have increased between 1972 and 1980, rising from 13 to 18 percent of those having a second child and from 27 to 44 percent of those having a child of a third or higher birth order. A small increase also occurred among those with obesity.

The percentage of mothers with varicosity who were sterilized postpartum decreased substantially between 1972 and 1980, from 34 to 23 percent (table 4). Caution is also required, however, in interpreting changes for mothers with varicosity. One physician (in a personal

communication with W. D. M.) reported that he was told to report varicosity if there were no clear medical reasons for sterilization, and if the mother's insurance company would pay for the operation only if there were medical reasons for performing it. Whether this practice was widespread is unknown.

**Type of delivery.** Twenty percent of the married women who delivered by cesarean section in 1980 were subsequently sterilized, about twice the proportion of women who delivered vaginally (table 1). Table 5 contains data on the percentage of mothers sterilized by type of delivery and birth order. To improve the reliability of the estimates of the percentage sterilized according to type of delivery, data on underlying medical conditions

and complications of pregnancy are grouped. In group 1 are the women with conditions associated with higher sterilization rates, and in group 2, the women with conditions associated with lower sterilization rates. Group A consists of women with complications associated with higher sterilization rates and group B, women with complications associated with lower sterilization rates.

Birth order, type of delivery, and type of complication or condition were all associated with the percentage of mothers sterilized, which ranged from 1 percent of mothers with first births and vaginal deliveries to 51 percent of mothers with third or higher order births and repeat cesarean deliveries. The percentage sterilized among mothers with vaginal deliveries and those with first cesarean sections was about 9 percent and among women

Table 3. Percentages of U.S. mothers sterilized following in-hospital delivery of a live infant in 1980, by medical conditions, complications, and live birth order

Medical conditions and complications	All orders		1st order		2d order		3d or higher order	
	Number in thousands	Percent sterilized						
Total women	3,581	10.6	1,553	0.9	1,147	11.6	881	26.5
Underlying medical conditions:								
0	2,871	9.9	1,283	.7	926	11.3	662	25.9
1 or more	710	13.5	270	2.0	221	12.8	219	28.3
Selected conditions:								
Varicosity	54	21.8	7	5.2	17	10.2	29	32.9
Obesity	144	12.7	51	1.9	43	11.2	50	25.9
Anemia	95	9.7	38	2.5	32	8.1	25	22.7
Rh incompatibility	75	11.8	36	1.1	21	17.4	18	25.9
Diabetes	41	21.5	12	5.6	15	19.6	13	39.1
Complications of pregnancy:								
0	2,535	10.2	1,070	.8	841	11.1	624	25.3
1 or more	1,045	11.6	483	1.2	306	13.0	257	29.4
Selected complications:								
Urinary infection	173	9.2	91	1.5	49	10.5	34	31.0
Anemia	116	8.1	53	1.9	34	8.0	30	19.2
Obesity	96	13.2	36	1.3	31	12.8	29	28.1
Excess weight gain	108	11.4	65	1.8	27	16.0	17	44.5
Hypertension	115	12.1	61	2.0	34	17.1	21	33.9
Toxemia preeclampsia	108	11.0	74	1.7	19	19.8	15	44.7
Complications of labor:								
0	2,538	11.2	956	.9	906	11.3	677	25.4
1 or more	1,043	9.4	598	1.0	241	12.5	204	30.1
Selected complications:								
Inadequate pelvis	109	6.7	88	1.3	12	27.7	8	33.5
Multiple birth	60	13.8	15	1.0	21	11.8	24	24.0
Premature rupture of membranes	190	8.4	105	1.0	51	12.8	34	24.2
Prolonged labor	131	5.1	99	1.6	17	5.8	15	34.4
Abnormal position of cord	78	9.3	38	1.3	23	9.3	16	30.0
Hypertension	65	13.1	34	2.8	16	19.0	14	30.7
Toxemia preeclampsia	90	7.9	65	1.6	13	9.7	12	41.4

<sup>1</sup> Figure does not meet standards of reliability or precision; that is, the relative standard error is 25 percent or more.

with repeat cesarean deliveries, about 36 percent—a difference of 27 percentage points. For women delivering babies of birth orders of 3 or higher, 23 percent of those with vaginal deliveries were sterilized, compared with 51 percent of those with repeat cesarean sections—a difference of 28 percentage points. The percentage sterilized following a first cesarean delivery was about the same as the percentage following vaginal delivery, both overall (9 percent) and for first births (1 percent). However, at the second and higher birth orders, the percentage sterilized following primary cesarean delivery was much higher than for vaginal delivery: 22 percent compared with 9 percent for second births and 39 percent compared with 23 percent for third and higher order births.

### Sterilization After Stillbirth

The pregnancies of 19,000 women resulted in late fetal deaths (or stillbirths) in 1980. Table 6 shows the percentage of these women who were sterilized postpartum, according to the 1980 National Fetal Mortality Survey. Overall, 6.1 percent were sterilized compared with 10.6 percent of the mothers of live-born infants. The proportion sterilized after a fetal death increased

Table 4. Percentages of U.S. married mothers sterilized following in-hospital delivery of a live infant, 1980 and 1972, by underlying medical conditions and live birth order

Underlying medical conditions	All orders	1st order	2d order	3d or higher order
<b>1980</b>				
Total women	11.3	1.0	11.8	26.9
0 conditions	10.6	.8	11.3	26.3
1 or more conditions	14.7	1.9	14.1	28.7
Selected conditions:				
Varicosity	22.9	1.0	12.4	33.5
Obesity	14.1	1.4	12.5	26.1
Anemia	11.3	4.0	10.2	21.2
Rh incompatibility	12.0	1.0	19.7	26.2
Diabetes	23.2	7.5	17.6	43.8
<b>1972</b>				
Total women	7.8	1.9	5.3	17.6
0 conditions	7.0	1.7	4.9	16.1
1 or more conditions	12.6	2.6	8.5	24.6
Selected conditions: <sup>2</sup>				
Varicosity	33.9	20.2	29.3	36.8
Obesity	11.9	1.0	9.8	25.3
Anemia	10.9	4.1	1.0	29.3
Diabetes	16.6	6.5	12.5	26.8

<sup>1</sup> Figure does not meet standards of reliability or precision; that is, the relative standard error is 25 percent or more.

<sup>2</sup> Data on Rh incompatibility were not collected in 1972.

from 1 percent among women with no live births to 18 percent among those who had delivered three or more live-born infants.

The proportion of women sterilized postpartum was 5 percent among those with no underlying medical conditions, but 14 percent among those with varicosity or anemia and 15 percent among those with diabetes. Although some of the figures are based on small numbers of cases, the percentage sterilized was higher for women with varicosity, anemia, or diabetes than for women without underlying medical conditions in each birth order category, except for women with varicosity who had three or more live-born infants.

About 47 percent of the women having stillbirths had one or more complications of pregnancy (table 2). Women who had complications were more likely to be sterilized. Women who had obesity or hypertension were more likely to be sterilized; the differences for excess weight gain, toxemia preeclampsia, and anemia were not significant.

### Postpartum Sterilization, 1972 and 1980

In discussing the conditions under which postpartum tubal sterilization—as compared with vasectomy—might be seriously considered, Greenhill and Friedman, state in their textbook of obstetrics and gynecology, (7a):

Hospitalization may be prolonged and postoperative recovery slow. This latter is acceptable when the sterilization procedure is being done at the same time as other indicated intraabdominal operations, such as cesarean section. Similarly, when done under an anesthesia that is being given for another reason, such as vaginal delivery, it is reasonable to operate; also when done during the first two to three days after a term delivery, it tends to be a relatively easy procedure because the puerperal uterus is enlarged and the tubes are held up out of the pelvis within easy reach through a small abdominal wall incision. At all other times and under other circumstances, tubal ligation must be considered a major undertaking with all the risks inherent in major abdominal surgery. Tubal cauterization through a laparoscope is clearly preferable as an interval procedure.

Given that these operations should be done only under special circumstances, and that 381,000 women had such operations in the United States in 1980, what are the characteristics of the women who have these operations? We will attempt to answer that question by comparing the women who were sterilized postpartum with those who were not.

Table 7 provides selected characteristics of both the 381,000 women who were sterilized postpartum in the United States in 1980 and the 3.2 million women who delivered live-born infants that year and were not ster-

ilized. Most of the postpartum operations (93 percent) were tubal sterilizations; only 1.4 percent were hysterectomies. Similarly, 94 percent of the postpartum operations were reported by the hospital as being "contraceptive," rather than "medically remedial." However, if the immediate reason for the operation was that pregnancy or continued contraceptive use (such as of the pill or IUD—intrauterine device) was contraindicated, the operation probably would be reported by the hospital as "contraceptive."

A comparison of the sterilized women in table 7 with those who were not shows that the sterilized women were older; 40 percent of those sterilized were 30 years of age or more, compared with only 17 percent of those not sterilized. The sterilized women also had more children; 61 percent had three or more, compared with 20 percent of the nonsterilized. The educational attainment of both groups was similar.

As to health characteristics, the sterilized mothers were more likely than the nonsterilized to have had one

Table 5. Percentages of U.S. mothers sterilized following in-hospital delivery of a live infant in 1980, by conditions and complications, live birth order, and type of delivery

Conditions and complications by live birth order	All kinds of deliveries		Vaginal deliveries		Primary C-section deliveries		Repeat C-section deliveries	
	Number in thousands	Percent sterilized	Number in thousands	Percent sterilized	Number in thousands	Percent sterilized	Number in thousands	Percent sterilized
<i>Underlying medical conditions</i>								
<i>All orders:</i>								
Total women	3,581	10.6	2,969	8.7	376	9.4	236	36.4
1 or more conditions	710	13.5	565	11.4	88	13.4	57	33.9
Group 1 <sup>1</sup>	599	14.3	474	12.0	77	13.0	49	37.7
Group 2 <sup>2</sup>	111	9.2	91	8.1	11	<sup>3</sup> 15.8	8	<sup>3</sup> 12.1
0 conditions	2,871	9.9	2,404	8.1	288	8.2	179	37.3
<i>1st order:</i>								
Total women	1,553	.9	1,273	.7	272	<sup>3</sup> 1.3	8	<sup>3</sup> 23.4
1 or more conditions	270	<sup>3</sup> 2.0	208	<sup>3</sup> 1.5	60	<sup>3</sup> 2.7	2	<sup>3</sup> 23.8
0 conditions	1,283	.7	1,064	<sup>3</sup> .5	213	<sup>3</sup> .9	6	<sup>3</sup> 23.3
<i>2d order:</i>								
Total women	1,147	11.6	955	8.5	51	22.4	141	28.3
1 or more conditions	221	12.8	180	9.3	12	36.4	30	24.5
0 conditions	926	11.3	776	8.3	39	18.1	111	29.3
<i>3d or higher order:</i>								
Total women	881	26.5	741	22.8	53	38.7	87	50.8
1 or more conditions	219	28.3	177	25.1	16	35.6	26	45.7
0 conditions	662	25.9	564	22.0	37	40.0	61	53.0
<i>Complications of pregnancy</i>								
<i>All orders:</i>								
Total women	3,581	10.6	2,969	8.7	376	9.4	236	36.4
1 or more complications	1,045	11.6	812	9.5	160	11.6	74	34.6
Group A <sup>4</sup>	742	12.6	564	10.1	125	13.9	53	36.4
Group B <sup>5</sup>	303	9.1	247	8.1	35	<sup>3</sup> 3.4	21	30.0
0 complications	2,535	10.2	2,157	8.5	216	7.8	162	37.3
<i>1st order:</i>								
Total women	1,553	.9	1,273	.7	272	<sup>3</sup> 1.3	8	<sup>3</sup> 23.4
1 or more complications	483	<sup>3</sup> 1.2	366	<sup>3</sup> .8	114	<sup>3</sup> 1.9	3	<sup>3</sup> 34.0
0 complications	1,070	.8	906	.7	159	<sup>3</sup> .9	6	<sup>3</sup> 18.0
<i>2d order:</i>								
Total women	1,147	11.6	955	8.5	51	22.4	141	28.3
1 or more complications	306	13.0	243	10.1	20	27.3	42	22.5
0 complications	841	11.1	712	8.0	31	19.1	99	30.8
<i>3d or higher order:</i>								
Total women	881	26.5	741	22.8	53	38.7	87	50.8
1 or more complications	257	29.4	202	24.5	26	42.3	30	51.7
0 complications	624	25.3	539	22.1	27	35.3	57	50.4

<sup>1</sup> Women who had conditions associated with higher sterilization rates (varicosity, a thyroid condition, obesity, cardiovascular-renal disease, asthma, an orthopedic condition, Rh incompatibility, diabetes, alcoholism, other drug abuse, or other conditions) and who had no conditions associated with lower sterilization rates.

<sup>2</sup> Women who had conditions associated with lower sterilization rates (congenital heart disease, anemia, other chronic pulmonary conditions, or sickle cell anemia).

<sup>3</sup> Figure does not meet standards of reliability or precision; that is, the relative standard error is 25 percent or more.

<sup>4</sup> Women who had complications associated with higher sterilization rates (obesity, inadequate weight gain, excessive weight gain, abnormal position of placenta, hypertension, toxemia preeclampsia, embolism, or other complications) and who had no complications associated with lower sterilization rates.

<sup>5</sup> Women who had complications associated with lower sterilization rates (urinary infection, anemia, rubella, abnormal position of cord, or eclampsia).

or more fetal losses—22 percent of the sterilized mothers compared with 13 percent of the nonsterilized. Sterilized mothers were also more likely to have had one or more underlying medical conditions—25 percent compared with 19 percent.

Sterilized mothers were about five times as likely as nonsterilized mothers to have delivered by repeat cesarean section—23 percent compared with 5 percent.

Table 7 also contains profiles of the married mothers who were and were not sterilized postpartum in 1972 and 1980. The number of married mothers sterilized postpartum increased by 50 percent between 1972 and 1980, from 220,000 to 331,000. Did the characteristics of the women being sterilized change? The data suggest that the characteristics of the women being sterilized had become less extreme in several respects by 1980. In both 1972 and 1980, about 40 percent of those sterilized were 30 years of age or older. In 1980, fewer were under 20 years of age than in 1972 (1 percent versus 5 percent) and fewer were older than 35 (12 percent versus 17 percent); thus, the mothers who were sterilized in 1980 were more likely to be 20–34 years of age. The propor-

tion of sterilized mothers who were white decreased from 87 percent in 1972 to 82 percent in 1980.

Looking at birth order, one sees that the proportion of married mothers sterilized postpartum after a third or later birth decreased from 70 to 61 percent. The proportion sterilized after a first birth also decreased, from 9 to 3 percent. Thus, 21 percent were sterilized after a second birth in 1972, compared with 35 percent in 1980.

There were two marked changes between 1972 and 1980 in the educational distribution of sterilized mothers. The proportion with 4 years or more of college decreased sharply, from 38 to 12 percent, and both the proportion with high school diplomas and the proportion with 1 to 3 years of college increased.

The proportion of sterilized married mothers with one or more underlying medical conditions did not change markedly between 1972 and 1980. Further, the difference between the sterilized and nonsterilized mothers in the percentage with each underlying condition was not large in either year (table 7). The only exception was in varicosity, and this difference may have been due to the reporting problem mentioned earlier. The possible effect

Table 6. Percentages of U.S. mothers sterilized following an inhospital stillbirth in 1980, by medical conditions, complications, and number of previous live births

Medical conditions and complications	Total		No previous live births		1 or 2 live births		3 or more live births	
	Number of women	Percent sterilized	Number of women	Percent sterilized	Number of women	Percent sterilized	Number of women	Percent sterilized
Total women	18,939	6.1	8,824	0.7	7,437	8.1	2,678	18.3
Underlying medical conditions:								
0	13,492	5.3	6,476	1.4	5,356	7.1	1,660	18.6
1 or more	5,447	8.1	2,348	1.4	2,081	10.8	1,018	17.9
Selected conditions:								
Varicosity	134	13.9	27	12.2	72	17.0	35	8.9
Obesity	1,297	9.2	460	1.0	503	13.1	334	16.0
Anemia	530	13.9	212	4.2	199	14.9	118	29.6
Rh incompatibility	457	5.7	204	1.0	207	9.6	46	12.9
Diabetes	804	15.1	280	2.1	272	22.1	252	22.0
Complications of pregnancy:								
0	9,958	4.7	4,760	1.3	3,980	6.5	1,219	15.7
1 or more	8,981	7.7	4,064	1.1	3,458	10.0	1,459	20.5
Selected complications:								
Urinary infection	925	14.8	450	1.6	329	6.3	145	14.1
Anemia	626	10.0	287	3.1	233	10.4	106	27.7
Obesity	1,125	10.9	400	1.0	423	14.1	302	20.7
Excess weight gain	629	8.5	345	1.7	215	16.6	68	17.2
Hypertension	1,432	9.5	619	1.0	520	12.0	293	23.2
Toxemia preeclampsia	999	8.1	590	2.0	303	14.9	106	22.4
Complications of labor:								
0	7,954	5.2	3,834	1.3	3,096	7.3	1,024	17.0
1 or more	10,985	6.8	4,990	1.0	4,341	8.8	1,654	19.2

<sup>1</sup> Figure does not meet standards of reliability or precision; that is, the relative standard error is 25 percent or more.

Table 7. Percentages of U.S. mothers with selected characteristics according to whether or not they were sterilized following an inhospital live birth, 1980 and 1972

Characteristics	1980						1972		
	All mothers			Married mothers			Married mothers		
	Total	Sterilized	Not sterilized	Total	Sterilized	Not sterilized	Total	Sterilized	Not sterilized
Total mothers (1,000s) ...	3,581	381	3,200	2,921	331	2,590	2,818	220	2,598
<b>Age of mother (years):</b>									
Less than 20 .....	15.6	2.2	17.2	9.8	11.4	10.9	14.7	5.0	15.6
20-24 .....	34.0	21.4	35.5	33.7	19.8	35.4	36.6	21.8	37.8
25-29 .....	30.6	36.7	29.9	34.3	37.7	33.8	30.2	31.6	30.0
30-34 .....	15.4	28.0	14.0	17.3	28.9	15.8	12.6	24.6	11.6
35 and over .....	4.3	11.8	3.4	4.9	12.2	4.0	5.9	16.9	5.0
<b>Race of mother:</b>									
White .....	81.3	76.5	81.8	88.5	81.7	89.4	88.4	86.9	88.5
All other .....	18.7	23.5	18.2	11.5	18.3	10.6	11.6	13.1	11.5
Black .....	15.6	19.4	15.2	8.3	14.1	7.6	9.9	12.4	9.7
<b>Live birth order of infant:</b>									
1st .....	43.4	3.8	48.1	40.4	3.4	45.1	38.0	9.0	40.5
2d .....	32.0	34.9	31.7	33.8	35.4	33.7	30.8	21.0	31.7
3d or higher .....	24.6	61.3	20.2	25.8	61.2	21.3	31.1	70.0	27.8
<b>Education of mother (years):</b>									
Less than 8 .....	4.4	6.4	4.2	3.8	6.4	3.5	4.3	4.9	4.3
9-11 .....	18.6	17.8	18.7	13.9	15.9	13.6	14.3	17.6	14.0
12 years .....	44.1	47.0	43.7	44.9	47.2	44.7	33.0	30.7	33.3
13-15 years .....	18.8	17.2	19.0	20.8	18.2	21.1	9.8	8.7	9.9
16 years or more .....	14.1	11.6	14.4	16.6	12.4	17.1	38.6	38.2	38.6
<b>Previous fetal losses:</b>									
0 .....	10.5	16.2	9.9	12.9	18.7	12.2	9.4	14.6	9.0
1 or more .....	3.2	6.0	2.8	3.9	6.8	3.5	4.2	8.2	3.9
<b>Underlying medical conditions:</b>									
1 or more .....	19.8	25.1	19.2	19.0	24.6	18.3	13.9	22.4	13.2
Selected conditions:									
Varicosity .....	1.5	3.1	1.3	1.6	3.2	1.4	1.3	5.8	0.9
Obesity .....	4.0	4.8	3.9	3.8	4.7	3.7	3.4	5.2	3.3
Anemia .....	2.6	2.4	2.7	2.2	2.1	2.2	1.3	1.8	1.3
Rh incompatibility .....	2.1	2.3	2.1	2.3	2.4	2.3	( <sup>2</sup> )	( <sup>2</sup> )	( <sup>2</sup> )
Diabetes .....	1.1	2.3	1.0	1.1	2.2	1.0	0.8	1.6	0.7
<b>Complications of pregnancy:</b>									
1 or more .....	29.2	31.8	28.9	27.7	31.6	27.3	16.3	21.9	15.8
Selected complications:									
Urinary infection .....	4.8	4.2	4.9	4.2	4.2	4.2	2.4	2.4	2.4
Anemia .....	3.2	2.5	3.3	2.8	2.0	2.9	1.8	3.0	1.7
Obesity .....	2.7	3.3	2.6	2.5	2.9	2.5	2.4	2.7	2.3
Excess weight gain .....	3.0	3.3	3.0	3.1	3.4	3.1	( <sup>2</sup> )	( <sup>2</sup> )	( <sup>2</sup> )
Hypertension .....	3.2	3.7	3.2	3.0	3.5	2.9	1.6	1.6	1.6
Toxemia preeclampsia ...	3.0	3.1	3.0	2.5	3.3	2.5	1.6	2.7	1.5
<b>Complications of labor:</b>									
1 or more .....	29.1	25.6	29.5	28.3	25.5	28.6	20.2	23.2	20.0
Selected complications:									
Inadequate pelvis .....	3.0	1.9	3.2	3.0	2.1	3.1	2.4	2.9	2.4
Multiple birth .....	1.7	2.2	1.6	1.7	2.1	1.7	1.4	1.6	1.4
Premature rupture of membranes .....	5.3	4.2	5.4	5.0	3.7	5.1	3.0	3.2	3.0
Prolonged labor .....	3.7	1.7	3.9	3.5	1.7	3.8	2.2	2.1	2.2
Abnormal position of cord .....	2.2	1.9	2.2	2.2	2.1	2.2	( <sup>2</sup> )	( <sup>2</sup> )	( <sup>2</sup> )
Hypertension .....	1.8	2.2	1.8	1.6	2.0	1.6	( <sup>2</sup> )	( <sup>2</sup> )	( <sup>2</sup> )
Toxemia preeclampsia ...	2.5	1.9	2.6	2.1	2.1	2.1	( <sup>2</sup> )	( <sup>2</sup> )	( <sup>2</sup> )

Table 7. Percentages of U.S. mothers with selected characteristics according to whether or not they were sterilized following an in-hospital live birth, 1980 and 1972—Continued

Characteristics	1980						1972		
	All mothers			Married mothers			Married mothers		
	Total	Sterilized	Not sterilized	Total	Sterilized	Not sterilized	Total	Sterilized	Not sterilized
Type of delivery:									
Vaginal .....	82.9	68.1	84.7	82.8	69.3	84.6	92.7	76.5	94.1
Primary cesarean section .....	10.5	9.3	10.6	10.2	9.4	10.3	7.3	23.5	5.9
Repeat cesarean section .....	6.6	22.6	4.7	6.9	21.3	5.1			
Type of operation:									
Hysterectomy .....	...	1.4	...	...	1.3	...	...	( <sup>2</sup> )	...
Tubal ligation .....	...	93.0	...	...	93.5	...	...	( <sup>2</sup> )	...
Other .....	...	5.6	...	...	5.2	...	...	( <sup>2</sup> )	...
Reason for operation:									
Medically remedial .....	...	1.7	...	...	1.4	...	...	( <sup>2</sup> )	...
Contraceptive .....	...	93.8	...	...	94.1	...	...	( <sup>2</sup> )	...
Both remedial and contracep- tive .....	...	4.5	...	...	4.5	...	...	( <sup>2</sup> )	...

<sup>1</sup> Figure does not meet standards of reliability or precision; that is, relative standard error is 25 percent or more.

<sup>2</sup> Data not collected in 1972. Leaders ( . . . ) indicate data not applicable.

of insurance coverage on reporting should also be considered when interpreting these differences.

About 22 percent of the mothers sterilized in 1972 had one or more complications of pregnancy, compared with 32 percent of those sterilized in 1980. However, this increase was no larger than the increase in the proportion of all mothers with complications between 1972 and 1980 (from 16 to 28 percent). Almost one of every three married mothers who was sterilized postpartum in 1980 (31 percent) had a cesarean delivery, compared with about one in four of those sterilized in 1972 (24 percent).

Therefore, married mothers who were sterilized postpartum in 1980, as compared with those sterilized in 1972, were more likely to be 20–34 years of age; less likely to be white; more likely to have experienced a second birth; more likely to have 12–15 years of education; and more likely to have had a cesarean delivery.

### Summary and Conclusions

About 381,000 of the women who gave birth to live infants in 1980, or 10.6 percent, were sterilized postpartum. Among married mothers, 7.8 percent were sterilized in 1972 and 11.3 percent in 1980. A desire for safe and efficient contraception is one possible reason for this increase in sterilizations. According to the hospitals, more than 94 percent of the postpartum sterilizations were performed primarily for contraceptive rather than for medical reasons. Although information that a hospi-

tal supplies may lack the mother's perspective, it is probable that substantial proportions of postpartum sterilizations are performed for contraceptive reasons. The fact that sterilization rates increase with increases in the child's live birth order lends support to this hypothesis.

The rising popularity of the two-child family is seen in the doubling of the sterilization rate between 1972 and 1980 among women who have delivered two live-born children. That contraception is a frequent motivation for sterilization may be inferred from the fact that a greater percentage of women were sterilized among those whose pregnancies resulted in live births (10.6 percent) than among whose pregnancies resulted in stillbirths (of whom only 6.1 percent were sterilized). Women whose pregnancies result in stillbirths apparently are not as prepared to preclude future childbearing as those whose pregnancies result in live births.

The mother's health status is also associated with decisions about postpartum sterilization. Previous fetal losses, underlying medical conditions (such as diabetes and varicosity) and complications of pregnancy and labor (such as excess weight gain and toxemia pre-eclampsia) may also predispose mothers and their physicians to consider sterilization.

Women who have had a second or higher order live birth by primary cesarean section are more likely to be sterilized than similar women who deliver vaginally. Women having repeat cesarean deliveries are more likely to be sterilized even if they have no adverse health

conditions or complications. Cesarean delivery is therefore associated with postpartum sterilization.

Most postpartum sterilizations in the United States are not done for medical reasons. The relative contributions of the reasons for sterilization that we have noted in this paper are not known. These issues deserve more attention from health researchers.

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## Infant Health Consequences of Childbearing by Teenagers and Older Mothers

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## Synopsis .....

*The association of childbearing at early and late ages with various adverse outcomes of pregnancy was explored in data collected in the 1980 National Natality and Fetal Mortality Surveys. The characteristics of interest for teenage mothers were marital status at conception and the trimester of pregnancy in which prenatal care was begun. For married mothers aged 30 years and older, the variables considered were employment status and occupation during the year preceding childbirth and smoking status before and during pregnancy. The pregnancy outcome variables analyzed were the same for both groups of mothers: fetal loss, low birth weight, and low 1-minute Apgar scores.*